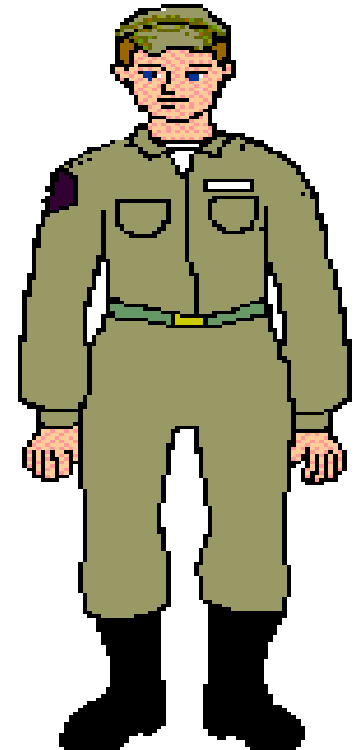




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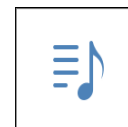
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# The Knee Joint

## By

# Prof Azza Kamal



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System

# ILOs:



- **By the end of this lecture, the student will be able to:**
- **Mention the type of knee joint.**
- **Identify the articulating surfaces.**
- **Describe joint capsule, ligaments , menisci , synovial membrane & correlate their clinical significance.**
- **Mention movements of the knee joint & predict muscle groups producing them.**
- **List nerves & vessels supplying knee joint .**
- **Describe factors stabilizing the knee**

# KEY POINTS OF LECTURE

## **KNEE JOINT:**

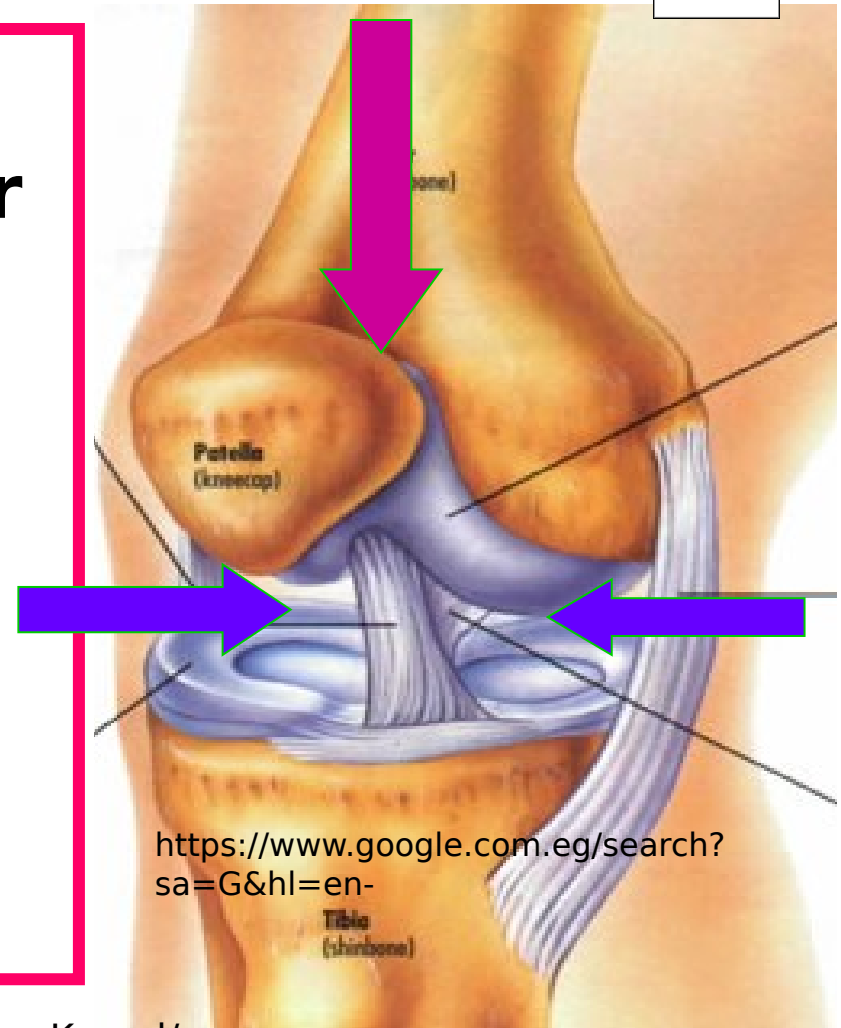
- 1) Type
- 2) Articulating surfaces
- 3) Capsules & ligaments
- 4) Menisci & synovial membranes
- 5) Movements
- 6) Nerves & vessels
- 7) Stabilizing factors



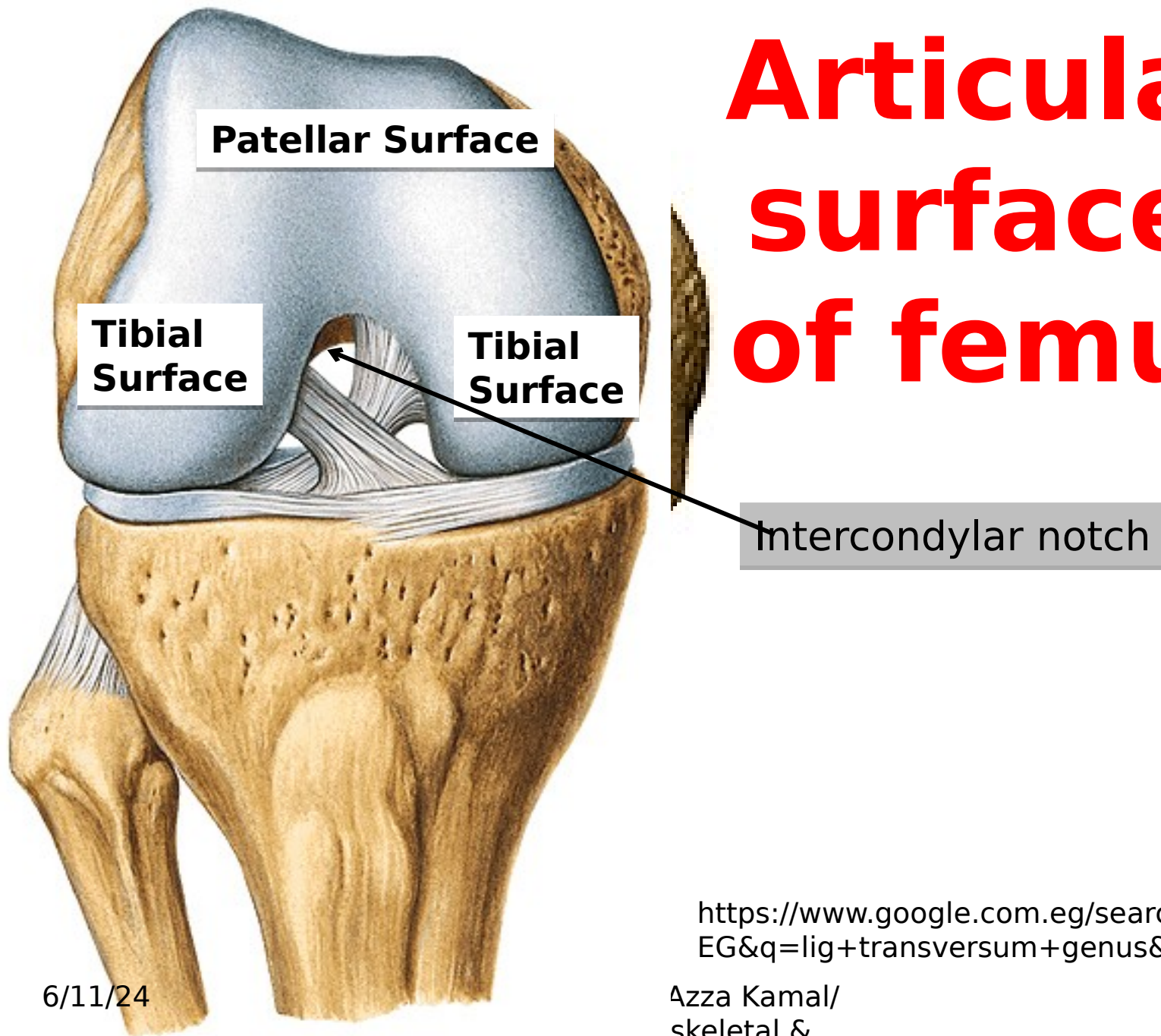
# The Knee Joint



- **Type :**
- **Synovial bicondylar**
- **Modified hinge synovial joint**
- **Compound joint:3 bones**
  1. **femoro - patellar**
  2. **femoro- tibial**



# Articular surface of femur



<https://www.google.com.eg/search?hl=en-EG&q=lig+transversum+genus&tbm>

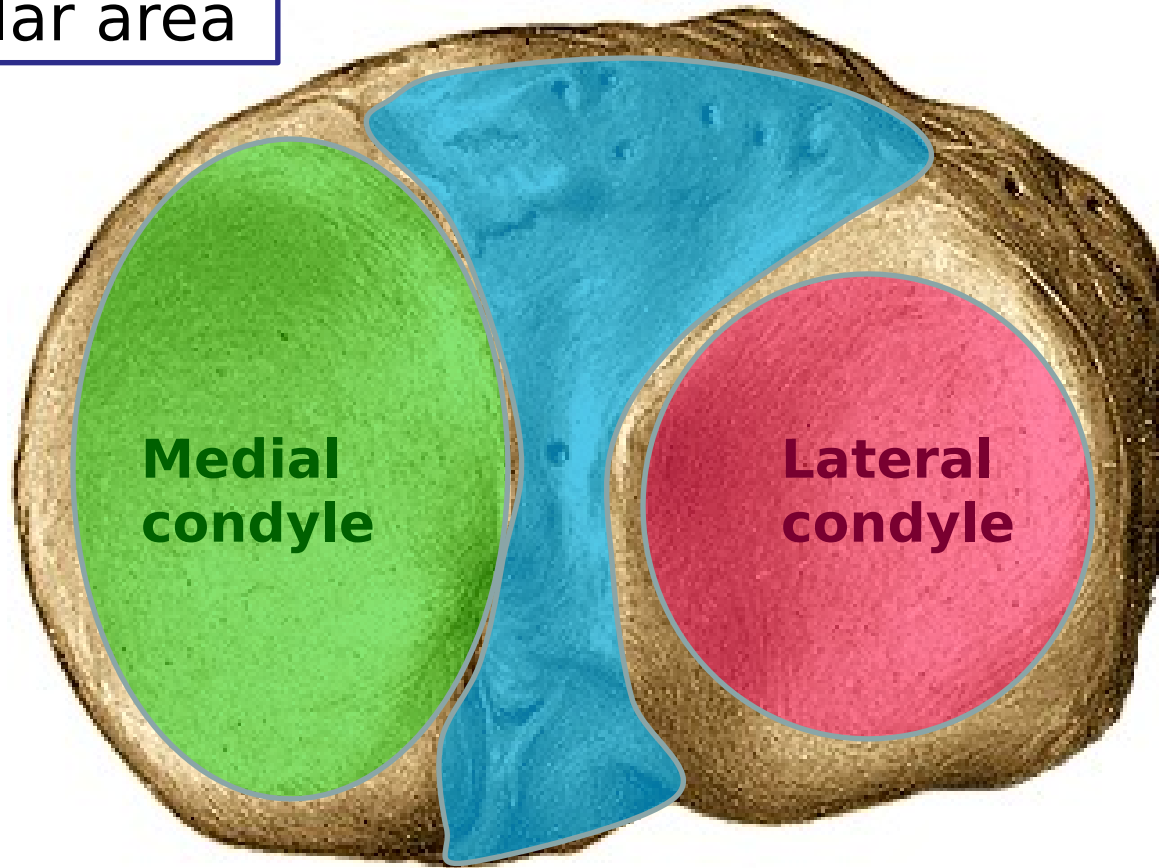
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# Articular surface of tibia



Intercondylar area



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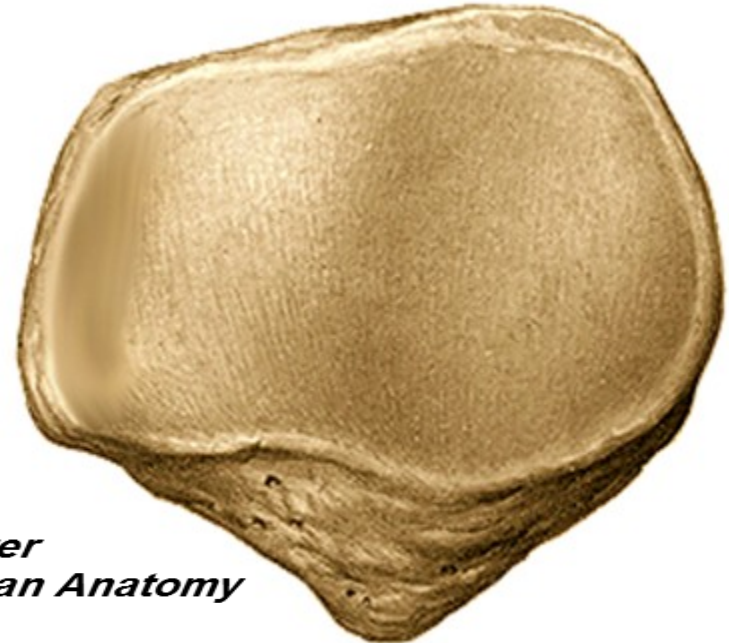
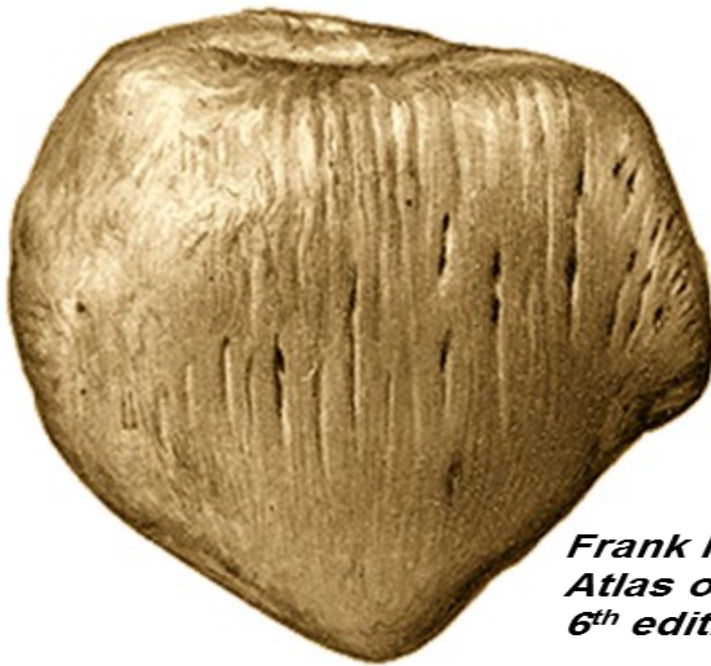
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*Frank H. Netter  
Atlas of Human Anatomy  
6<sup>th</sup> edition*



# Patella

articular surface of patella □  
posterior surface



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Atlas of Human Anatomy  
6<sup>th</sup> edition*

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Anterior view

Posterior view

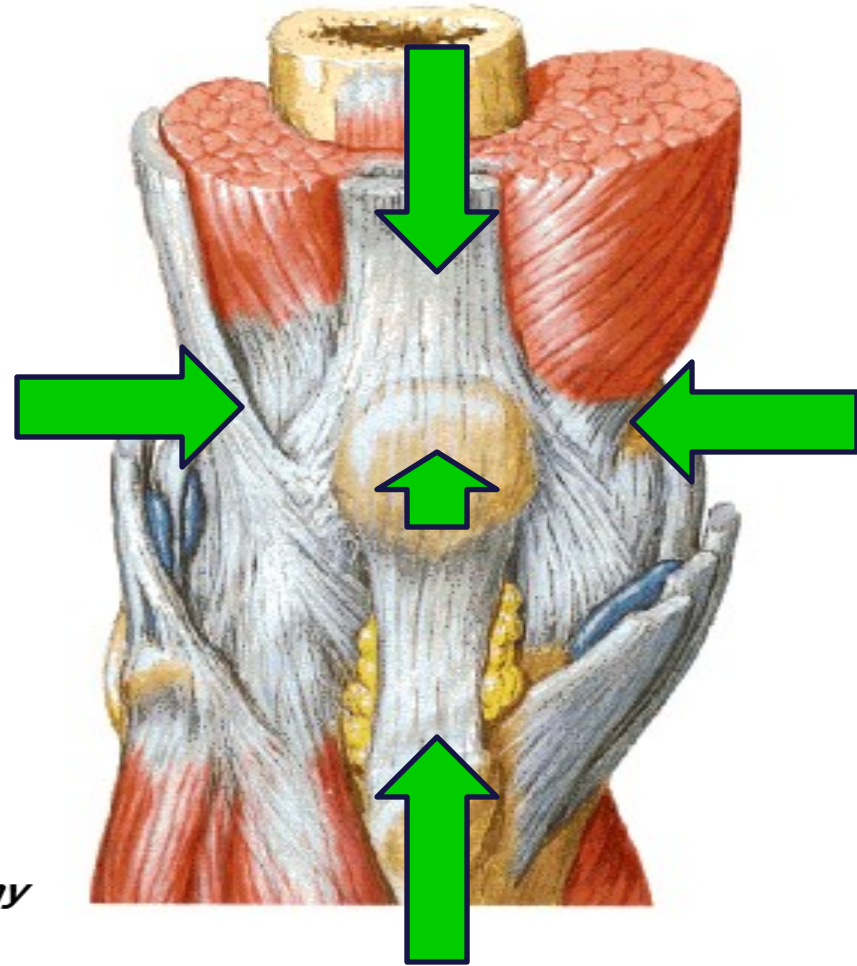
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# The fibrous capsule

- Anteriorly the capsule is absent & is replaced by quadriceps tendon, patella, ligamentum patellae & patellar retinacula



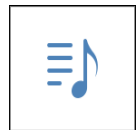
*Frank H. Netter  
Atlas of Human Anatomy  
6<sup>th</sup> edition*

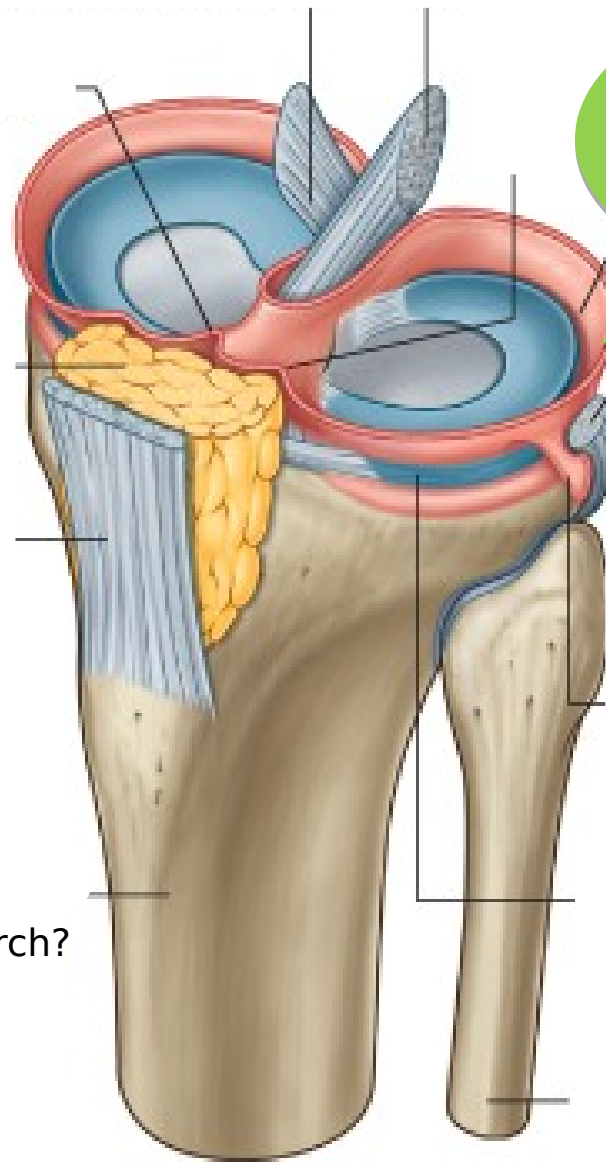




# **The synovial membrane**

- **More extensive than any other joint due to large size & complexity of knee joint**
- **Lines the inner surface of capsule & covers everything inside the joint except the articulating surfaces**
- **Extends deep to quadriceps tendon forming suprapatellar bursa**





**The  
synovial  
membran**

**e**



<https://www.google.com.eg/search?sa=G&hl=en->

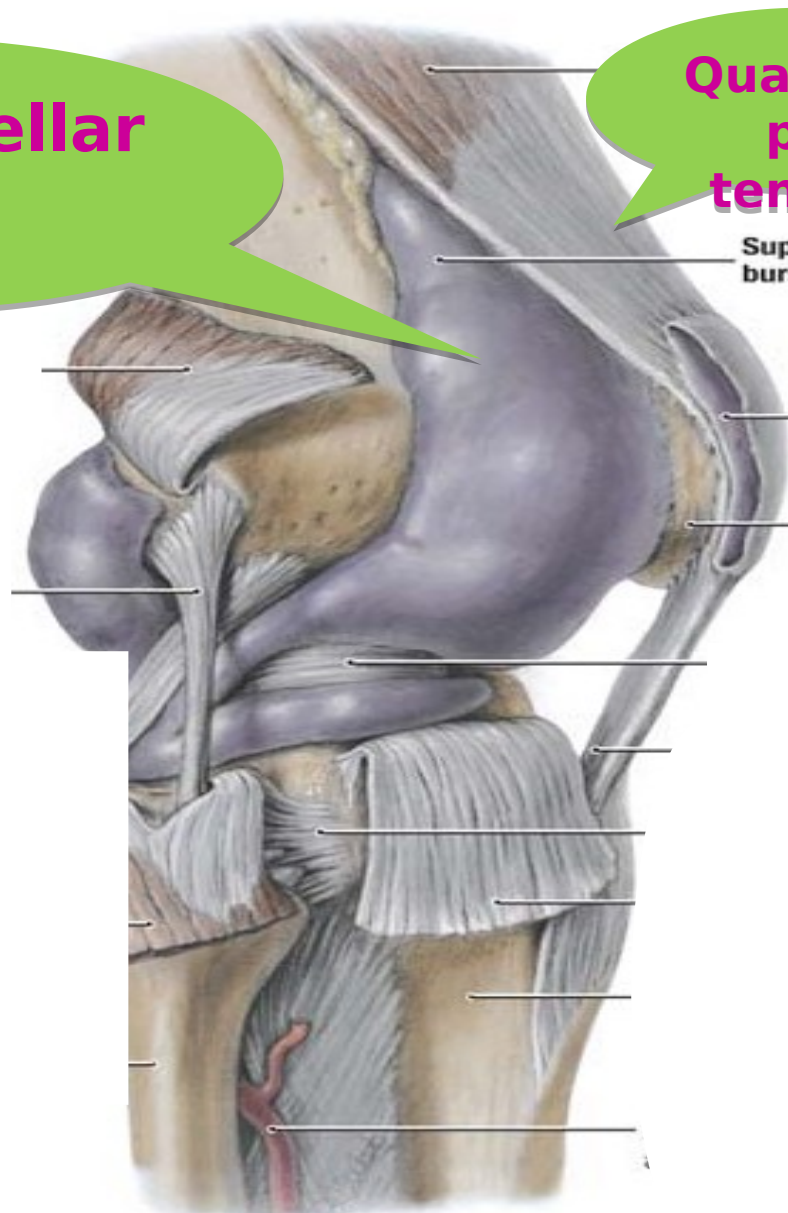
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**Suprapatellar  
bursa**

**Quadrice  
ps  
tendon**

Suprapatellar  
bursa



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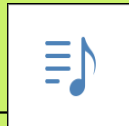
<https://lh3.googleusercontent.com/MRSYAYdLz2FYdbk9Fvkv1>  
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# Ligaments of knee joint

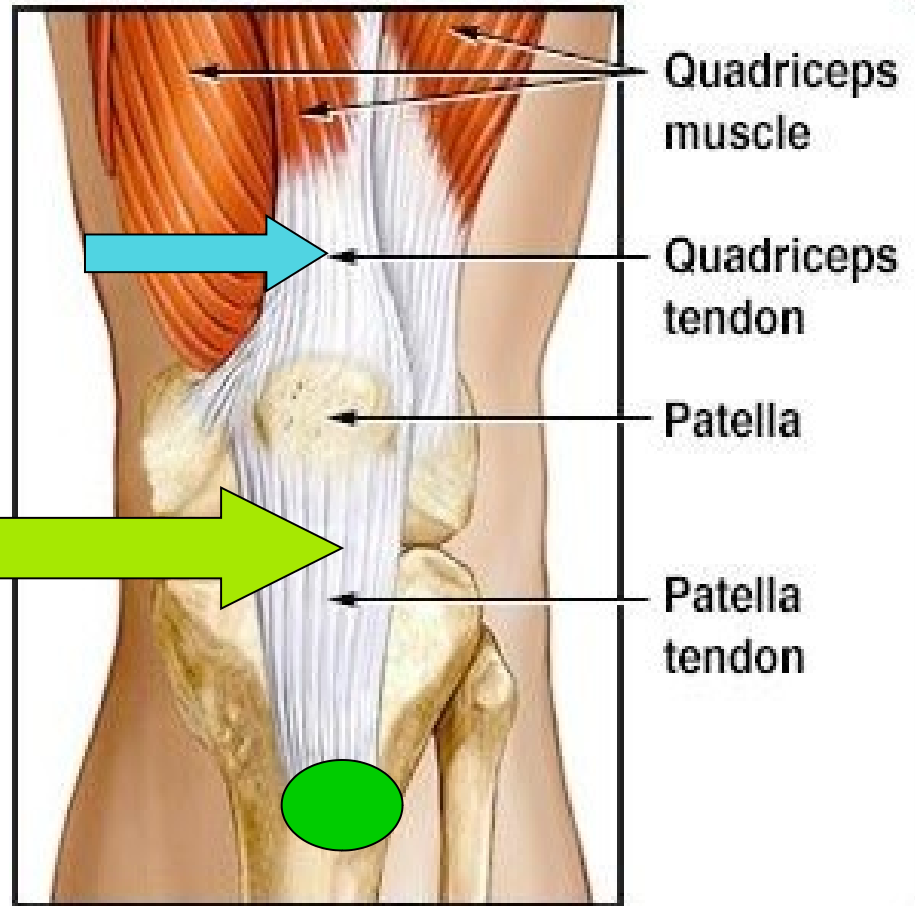
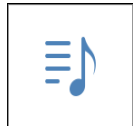
## Very Important

| Extracapsular ligaments               | Intracapsular ligaments               |
|---------------------------------------|---------------------------------------|
| Ligamentum patellae                   | Anterior cruciate                     |
| Tibial (Medial) collateral ligament   | Posterior cruciate                    |
| Fibular (Lateral) collateral ligament | Transverse ligament of the knee joint |
| Posterior oblique ligament            |                                       |



# Extracapsular ligaments

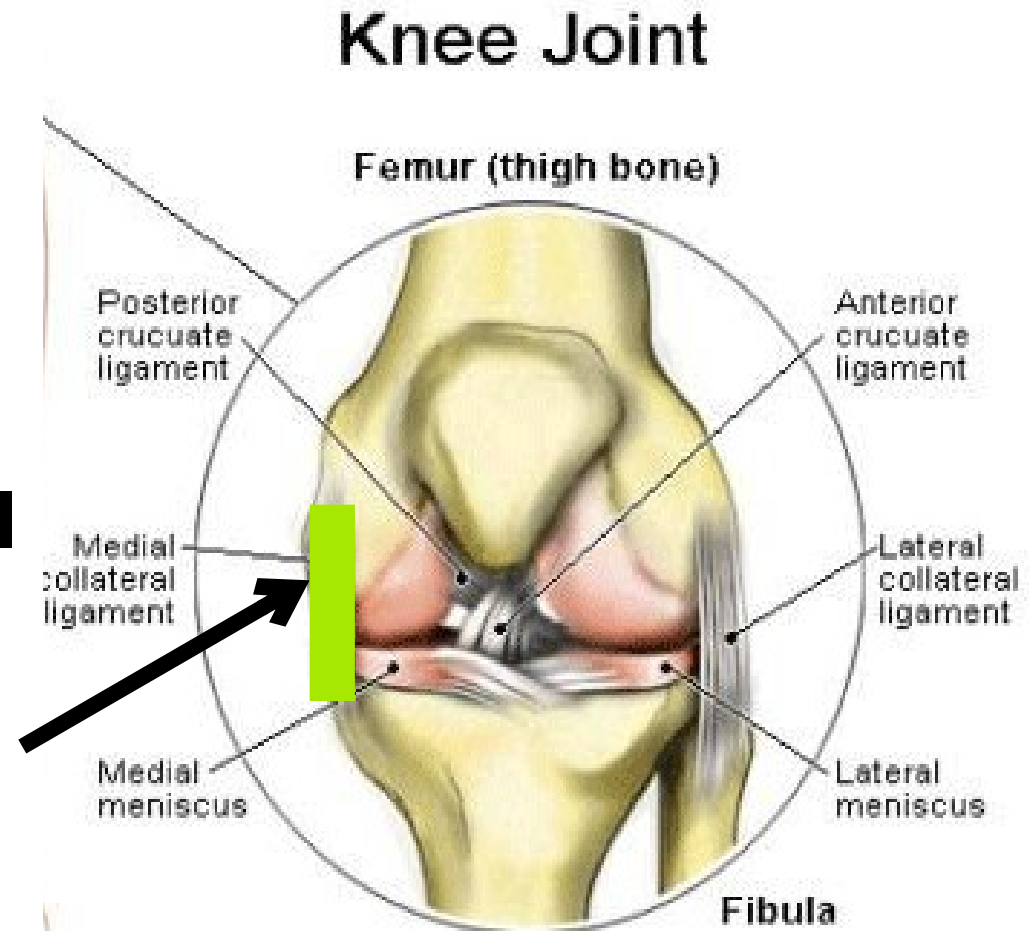
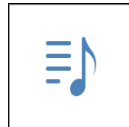
- **Ligamentum patellae:**
- **Extension of quadriceps tendon to insert into tibial tuberosity**



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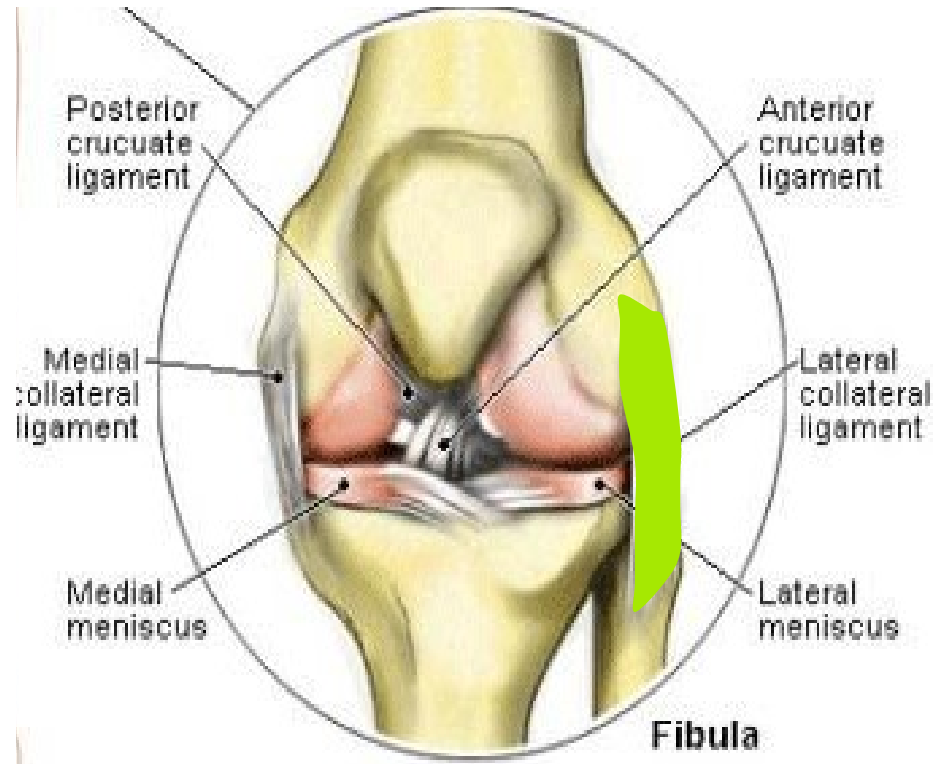
# Tibial collateral ligament

- **Lies on medial aspect of knee joint**
- **It is firmly adherent to the capsule & medial meniscus**

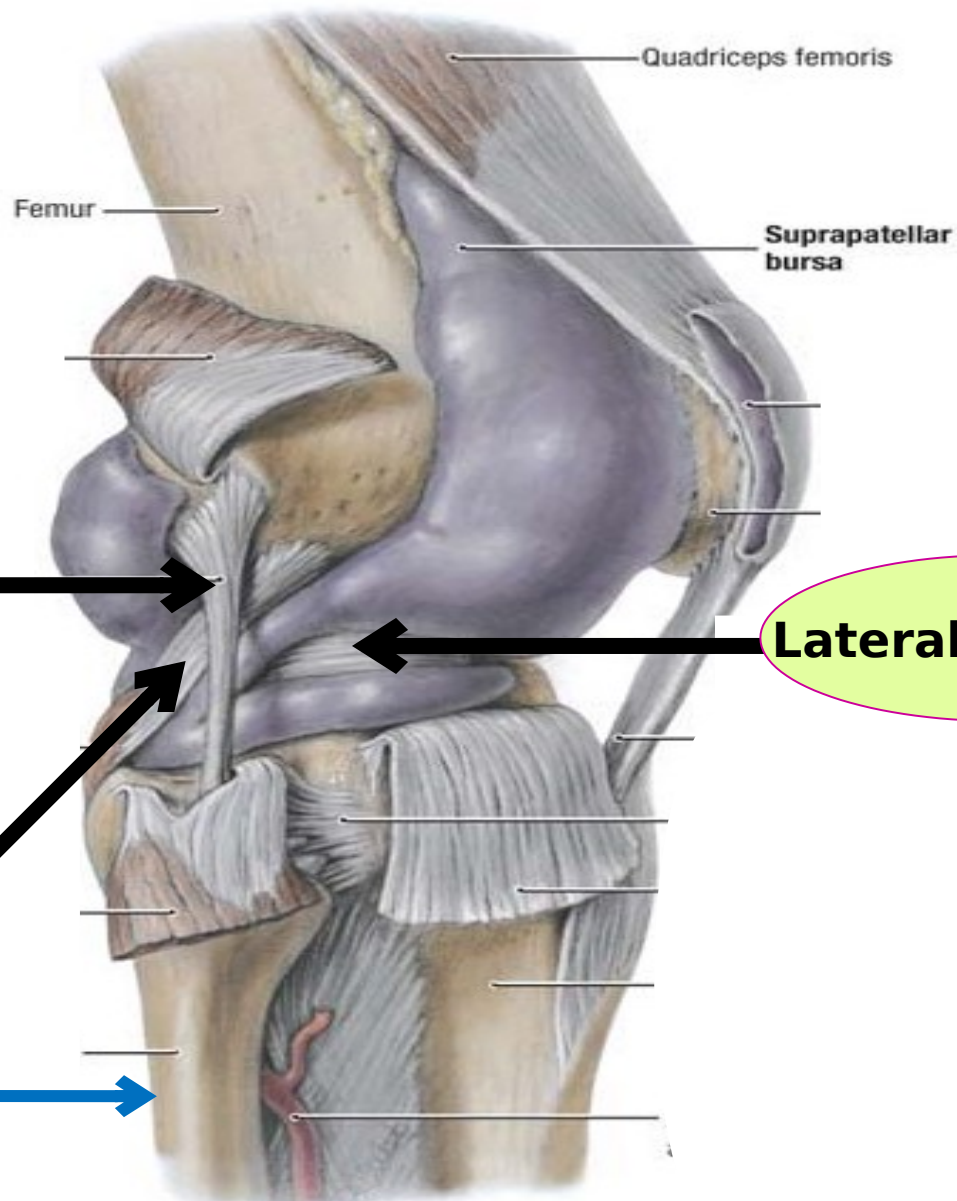


# Fibular collateral ligament

- Lies on lateral aspect of knee joint
- It is not adherent to capsule or lateral meniscus but is separated from them by tendon of popliteus



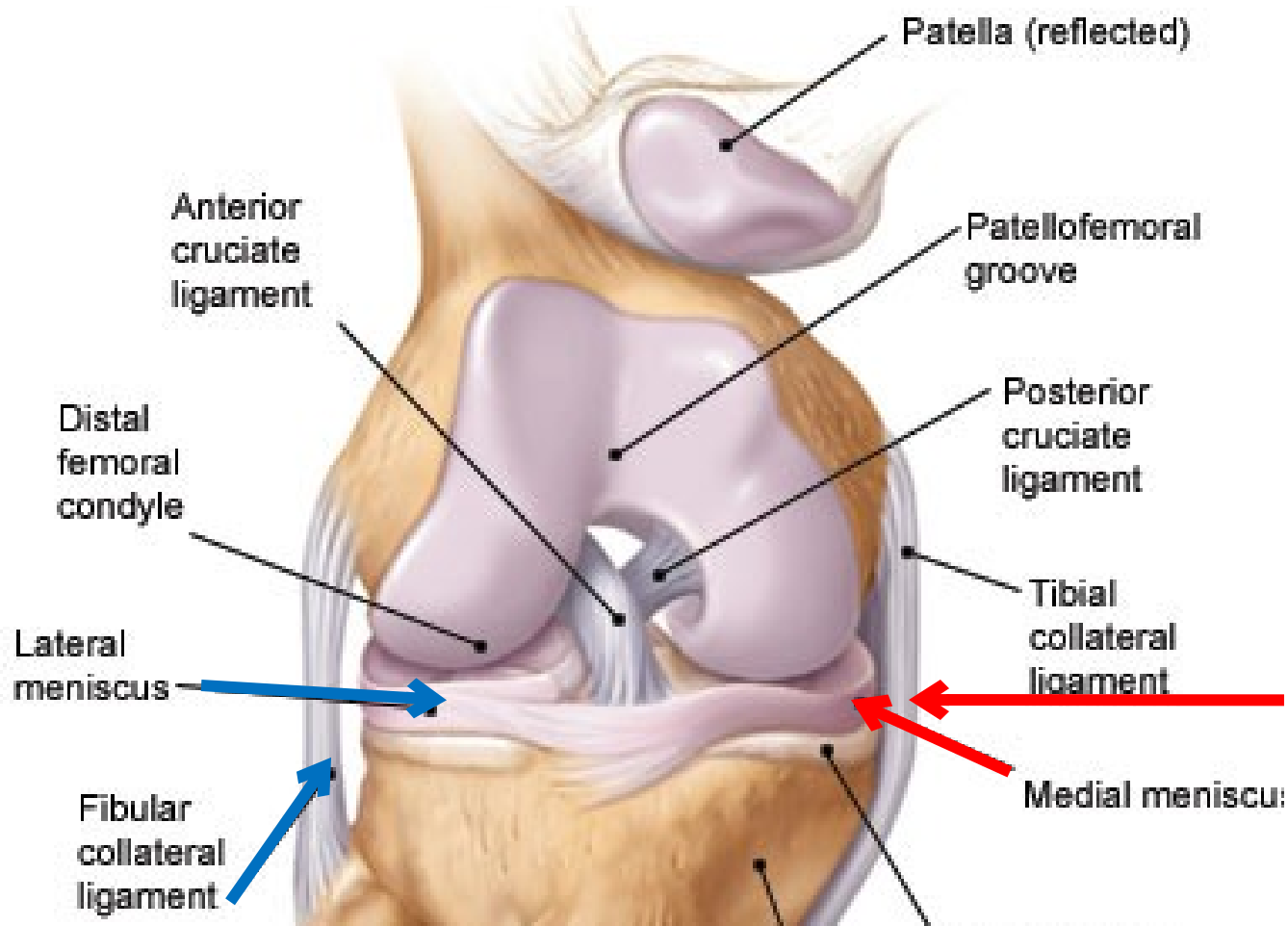
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<https://lh3.googleusercontent.com/MRSYAYdLz2FYdbk9Fvkv1>

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**Fibular collateral ligament  
separated from lateral meniscus**

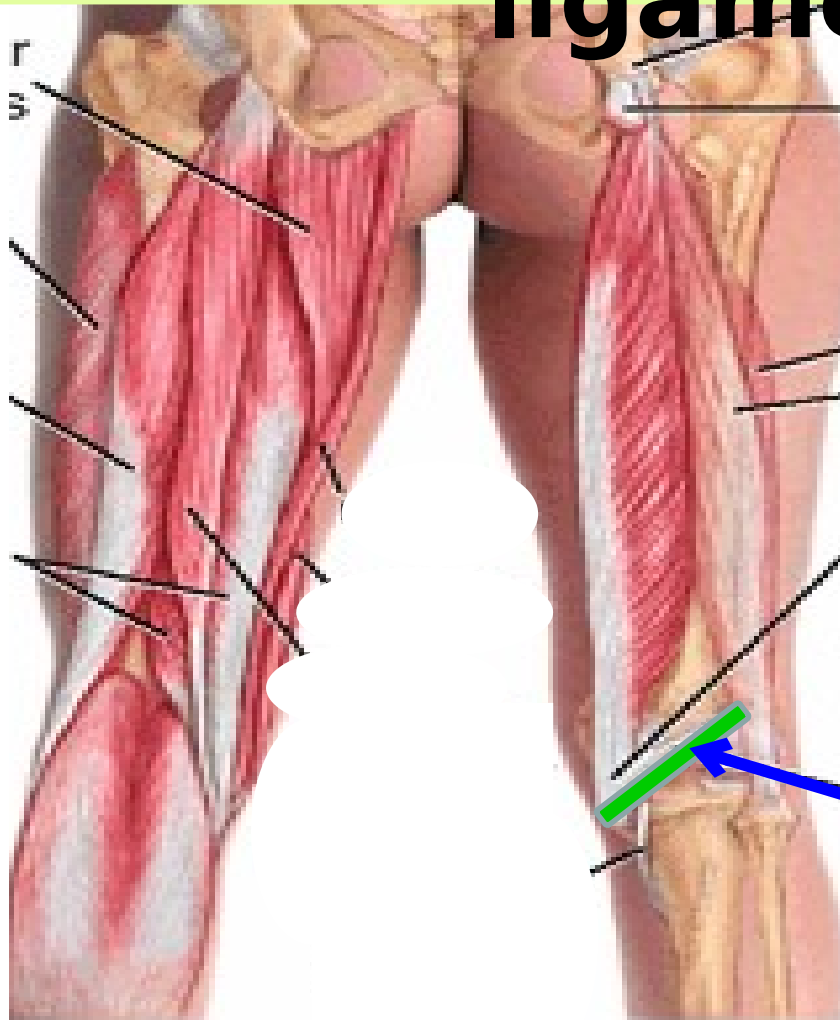
**Tibial collateral ligament  
is attached to medial meniscus**

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<https://lh3.googleusercontent.com/Z9AMMYa3lOpsUzl6Xo->

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# The posterior oblique ligament



Formed by fibers reflected from insertion of semimembranosus

Oblique popliteal ligament

Posterior views

[https://lh3.googleusercontent.com/Cpl6\\_cN-boLJoIwWtxuA16BgFR-](https://lh3.googleusercontent.com/Cpl6_cN-boLJoIwWtxuA16BgFR-)

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# Intracapsular ligaments

- **The cruciate ligaments:**
- They are **2** ligaments anterior & posterior cruciate ligaments which form an **X** shaped figure in the intercondylar notch.
- Very strong ligaments which connect intercondylar area of tibia with intercondylar notch of femur





# MENISCI

**Medial  
meniscus**

**Lateral meniscus**

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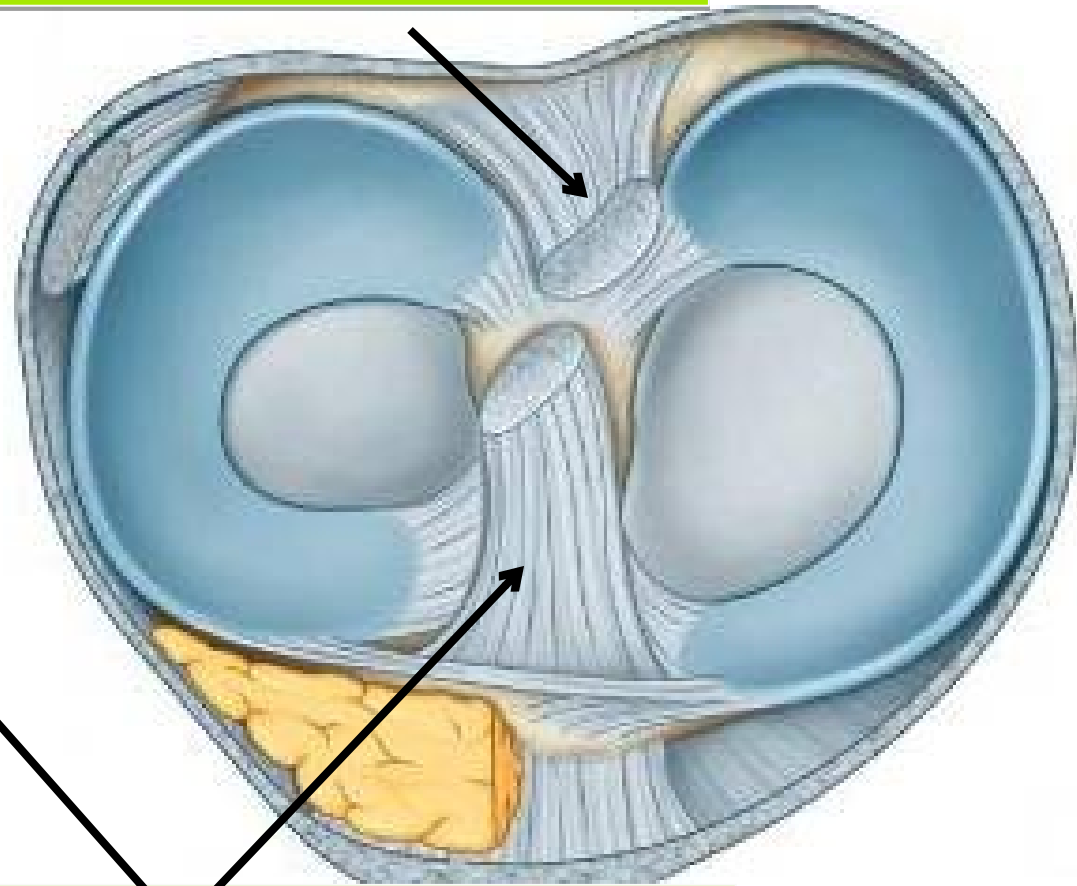
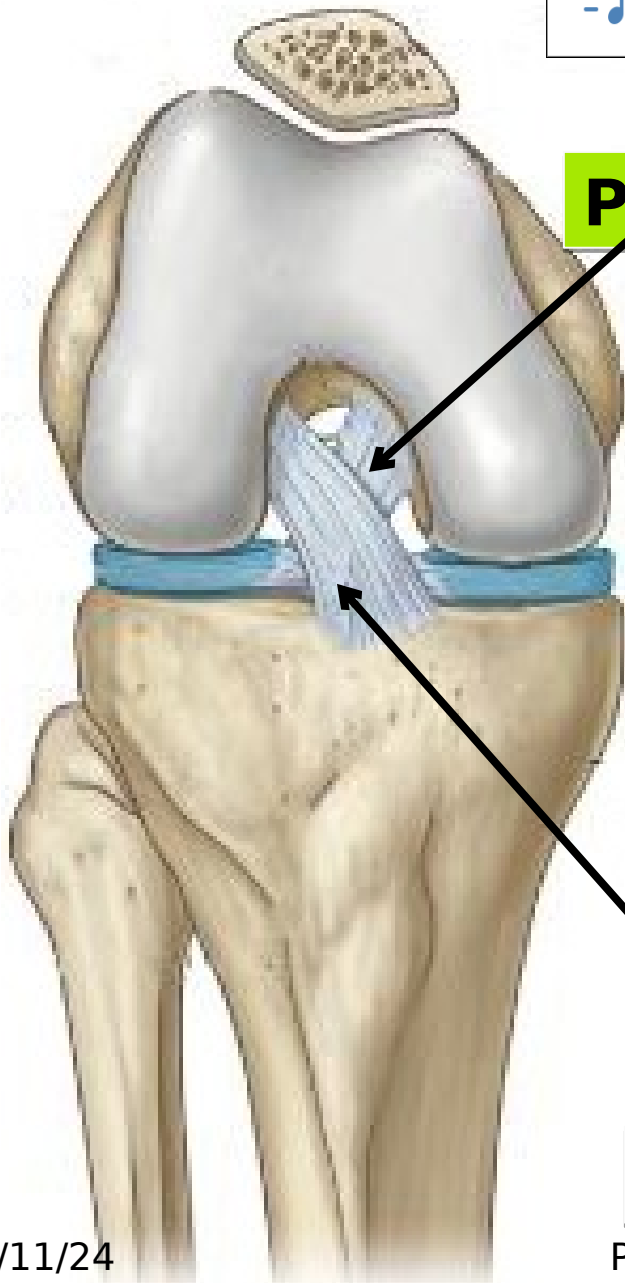
<https://www.google.com.eg/search?hl=en-EG&q=lig+transversum+genus>





# Cruciate ligaments

**Posterior cruciate lig.**



**Anterior cruciate lig.**

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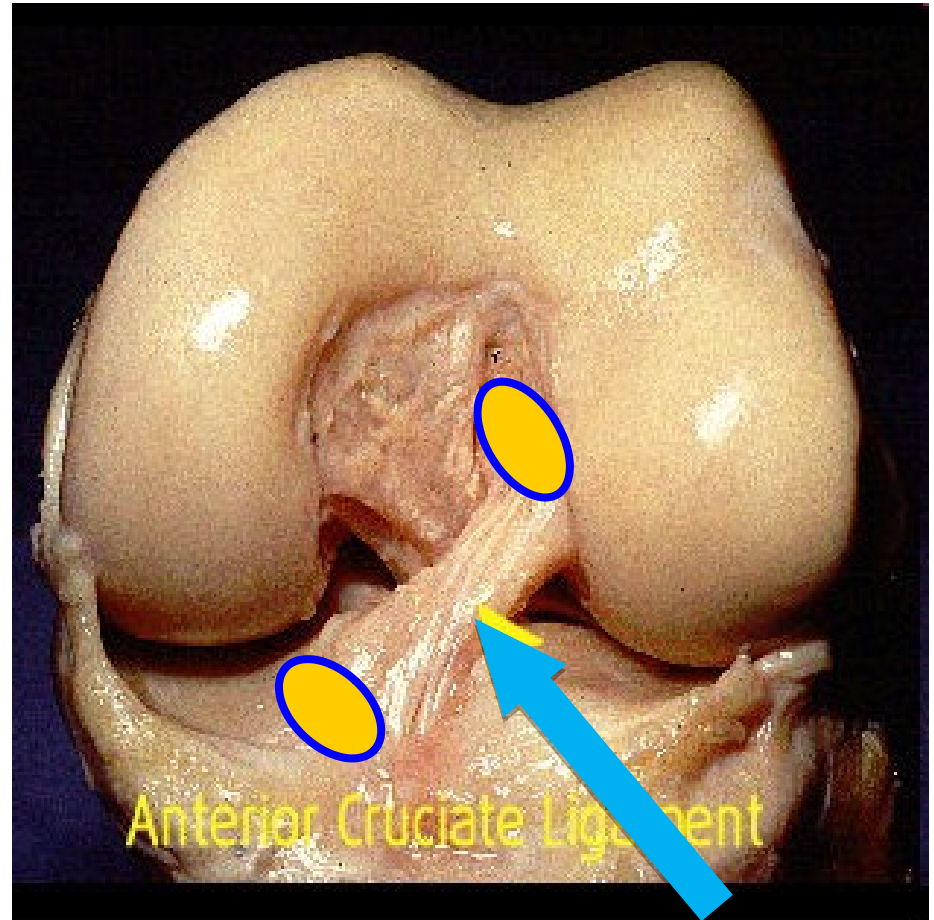
<https://www.google.com.eg/search?hl=en-EG&q=lig+transversum+genus&tbm>

# Anterior cruciate ligament



- Attached to anterior intercondylar area of tibia behind anterior horn of medial meniscus
- Passes upwards, backwards & laterally to attach to lat. condyle of femur
- Becomes tense during extension of knee joint □

**prevents  
hyperextension  
of knee joint**



<https://www.google.com.eg/search?sa=G&hl=en->

# Posterior cruciate ligament

- Attached to the most post. part of the post. intercondylar area of tibia behind post. horns of both menisci
- It extends upwards, forwards & medially to attach to medial condyle of femur

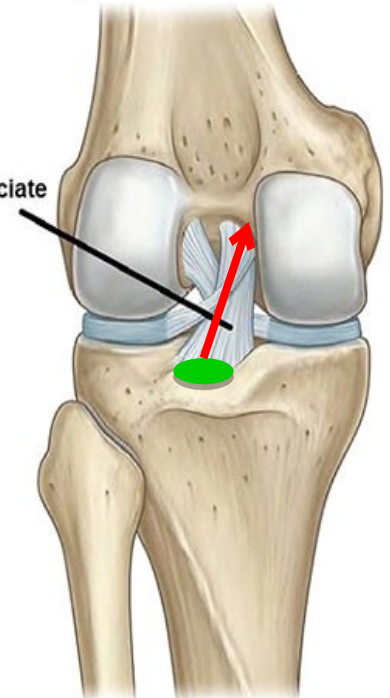
- It is stronger than ant. cruciate ligament
- It becomes tense during flexion of knee
- In the weight bearing flexed knee as in walking down the stairs it is the main

anterior view of left knee



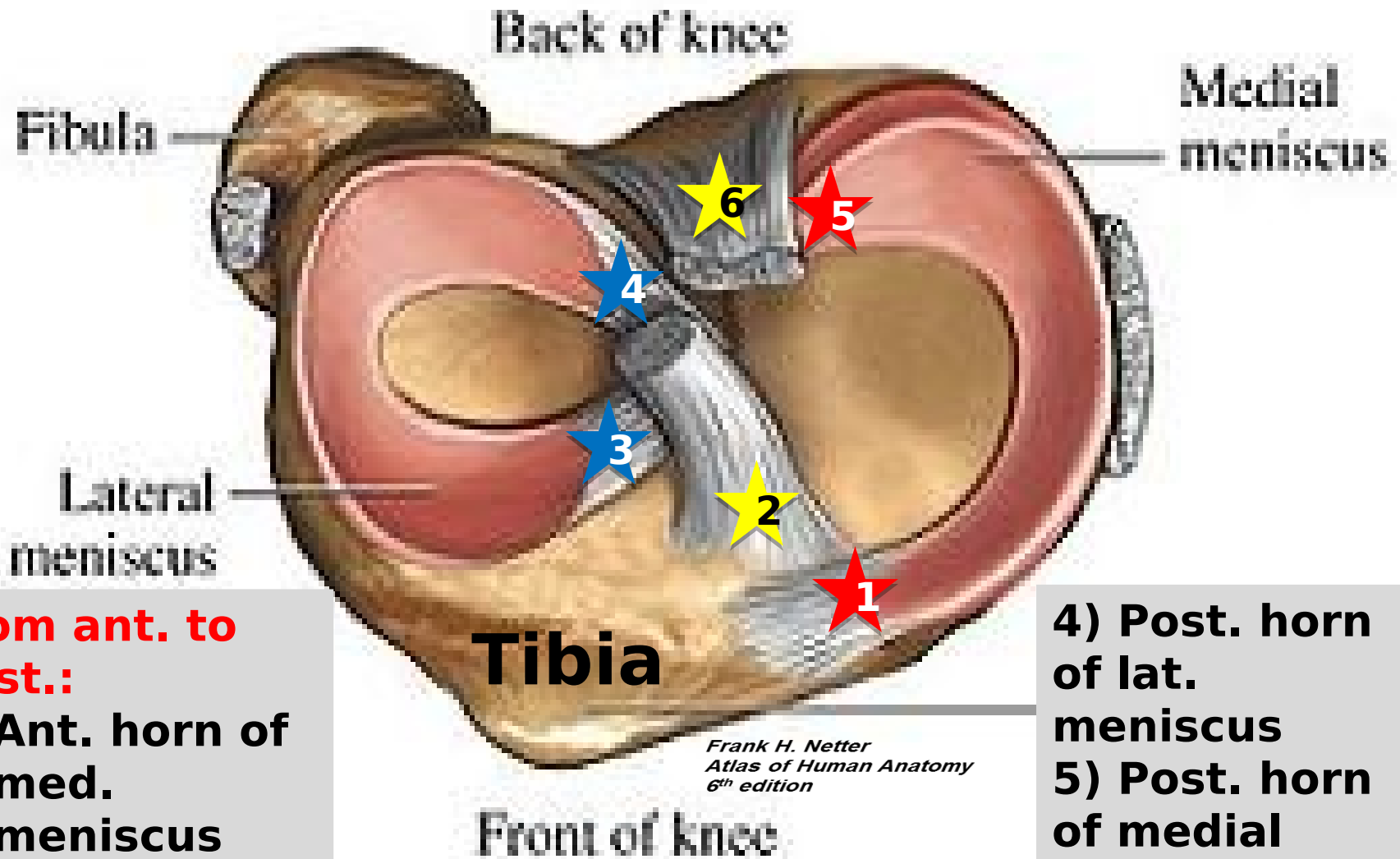
posterior view of left knee

posterior cruciate ligament





# TIBIAL PLATEAU



**From ant. to post.:**

1) Ant. horn of med. meniscus

2) Ant. cruciate

3) Ant. horn of lat. meniscus

4) Post. horn of lat. meniscus

5) Post. horn of medial meniscus

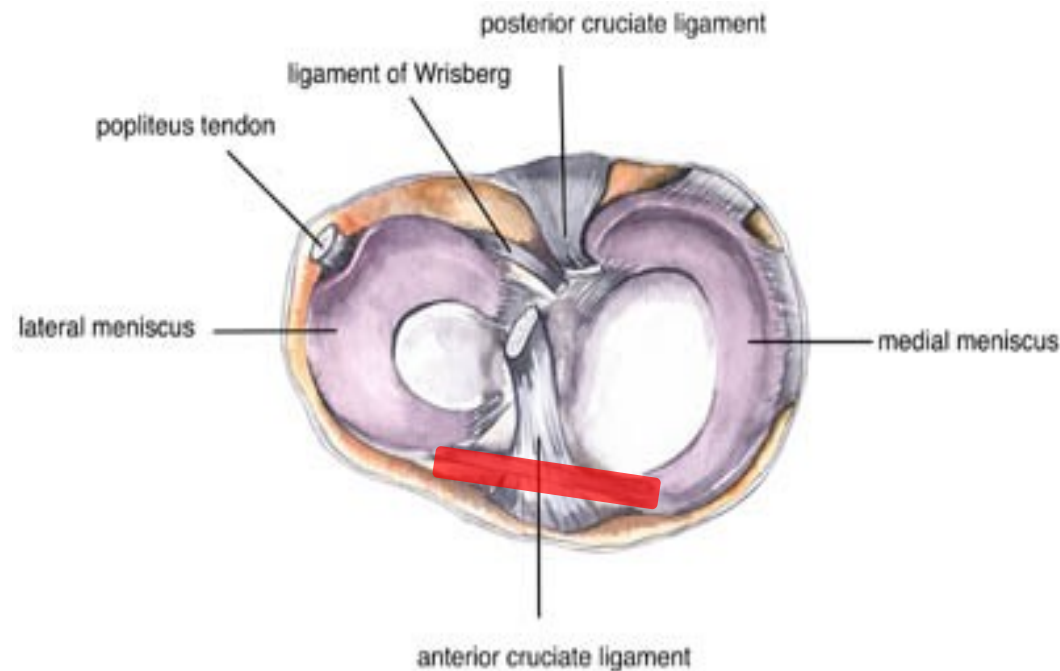
6) Posterior cruciate

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# The transverse ligament



- A thin ligament lying transversely joining the anterior horns of both menisci

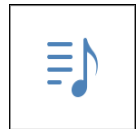


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Atlas of Human Anatomy  
6<sup>th</sup> edition*

**Which of the following ligaments is separated from the capsule and meniscus by the tendon of popliteus muscle?**



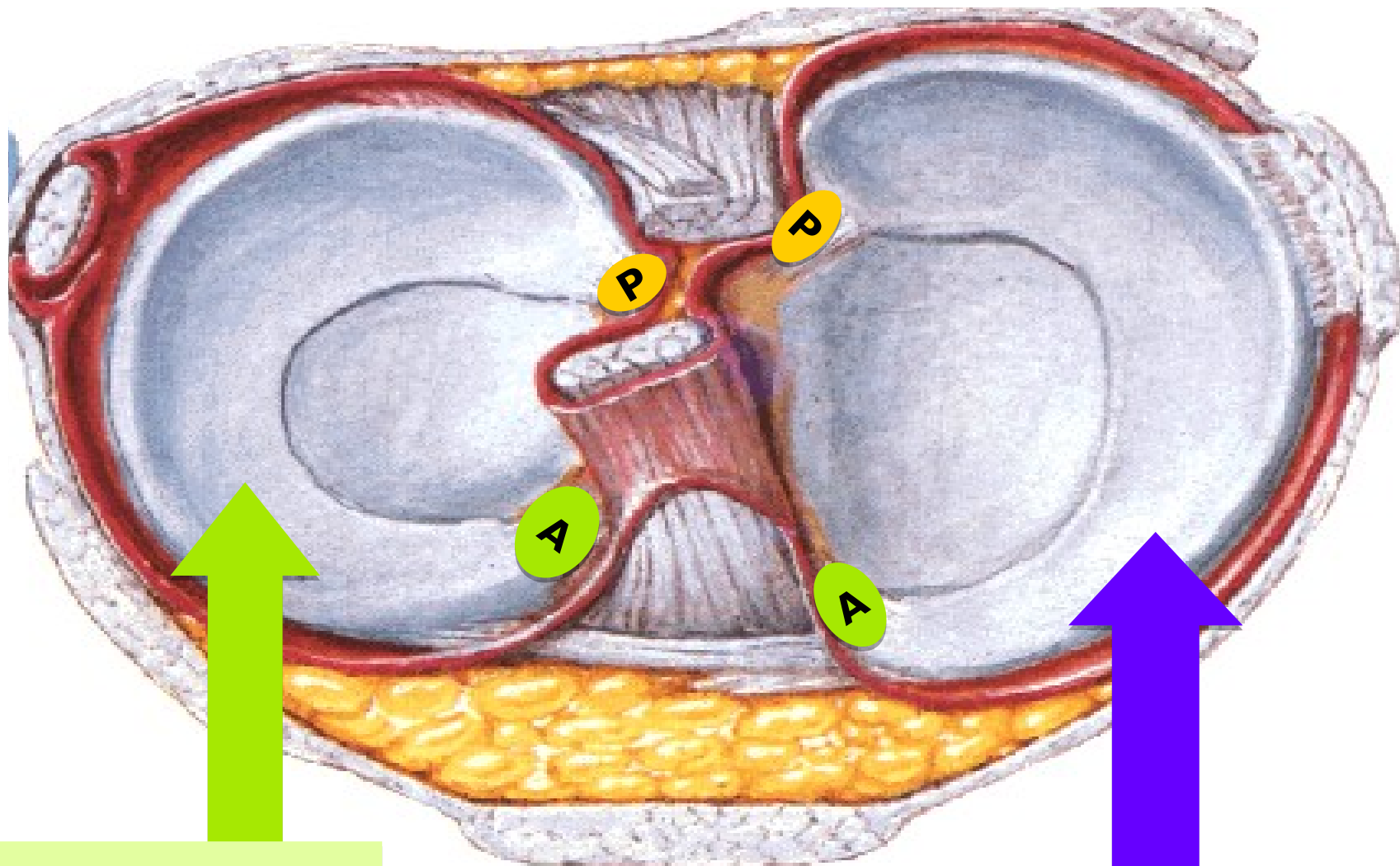
- A. Tibial collateral ligament
- B. Fibular collateral ligament
- C. Ligamentum patellae
- D. Anterior cruciate ligament
- E. Posterior cruciate ligament

# The Menisci

- **2 -C shaped fibrocartilagenous plates which partly cover the articular surfaces of both tibial condyles.**
- **Each meniscus is attached to ant. intercondylar area by an ant. horn & to post. intercondylar area by a post. horn.**
- **The peripheral border of each meniscus is thick & gradually thins towards the center**







**Lateral meniscus**

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Atlas of Human Anatomy  
6<sup>th</sup> edition*

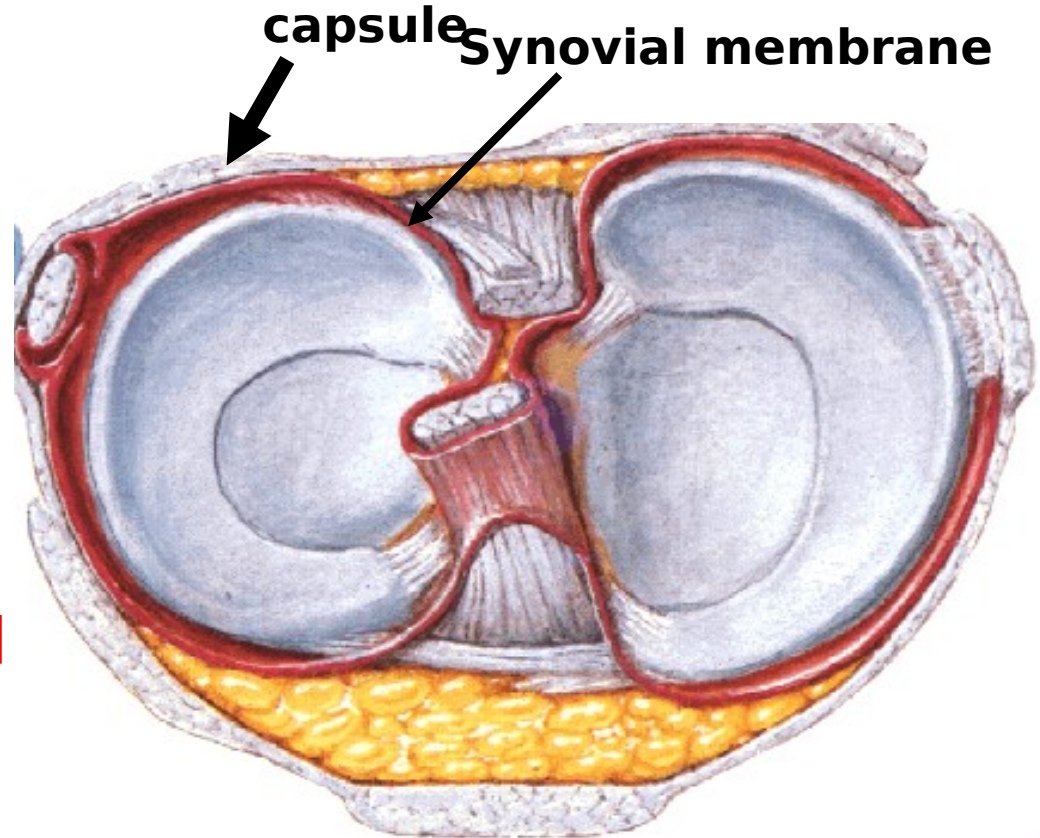
 **Medial meniscus**

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# Menisci

- **Intracapsular & intrasynovial**
- **Lower surface is flat for tibial condyles**
- **Upper surface is concave for femoral condyles**
- **Outer part of each meniscus is supplied by arteries, while inner part is avascular & so more liable to tears.**




*Frank H. Netter  
Atlas of Human Anatomy  
6<sup>th</sup> edition*

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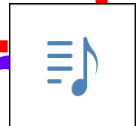
# Functions of menisci

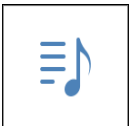
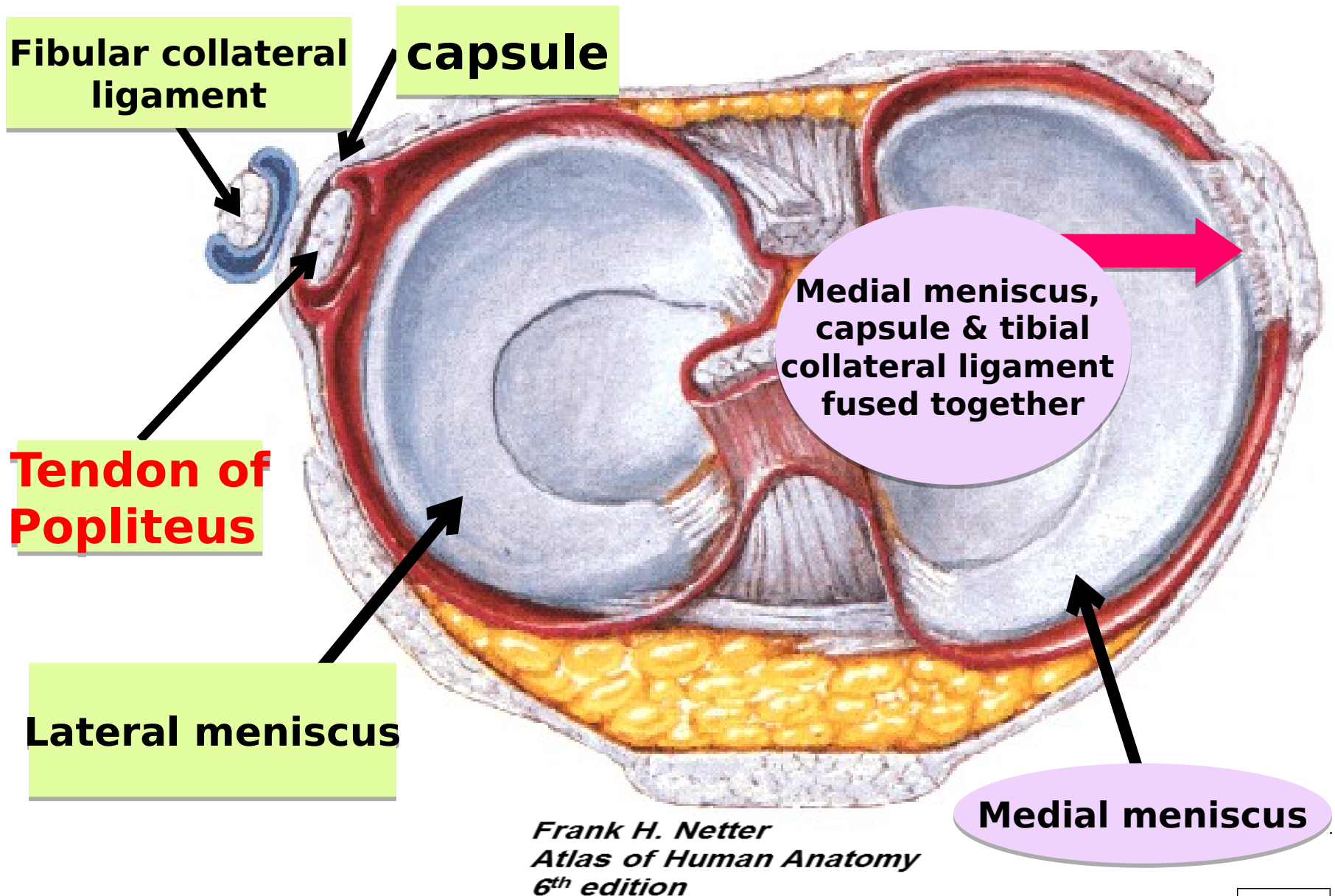
- Adapt femoral to tibial condyle 
- Shock absorbers
- Lubricate articular surfaces with synovial fluid
- In flexion & extension of knee joint □ menisci move with tibia
- In rotatory movements of knee, with the foot fixed on the ground □ menisci move with femur

# Applied Anatomy

- The tibial collateral ligament of the knee joint is adherent to the capsule & to the medial meniscus. This restricts the mobility of the medial meniscus .
- The lateral meniscus is not fixed to the capsule or the fibular collateral ligament but is separated from them by the tendon of popliteus, so it can adapt itself to sudden rotatory movements in the knee.
- This explains why

the medial meniscus is more liable to injury than the lateral meniscus





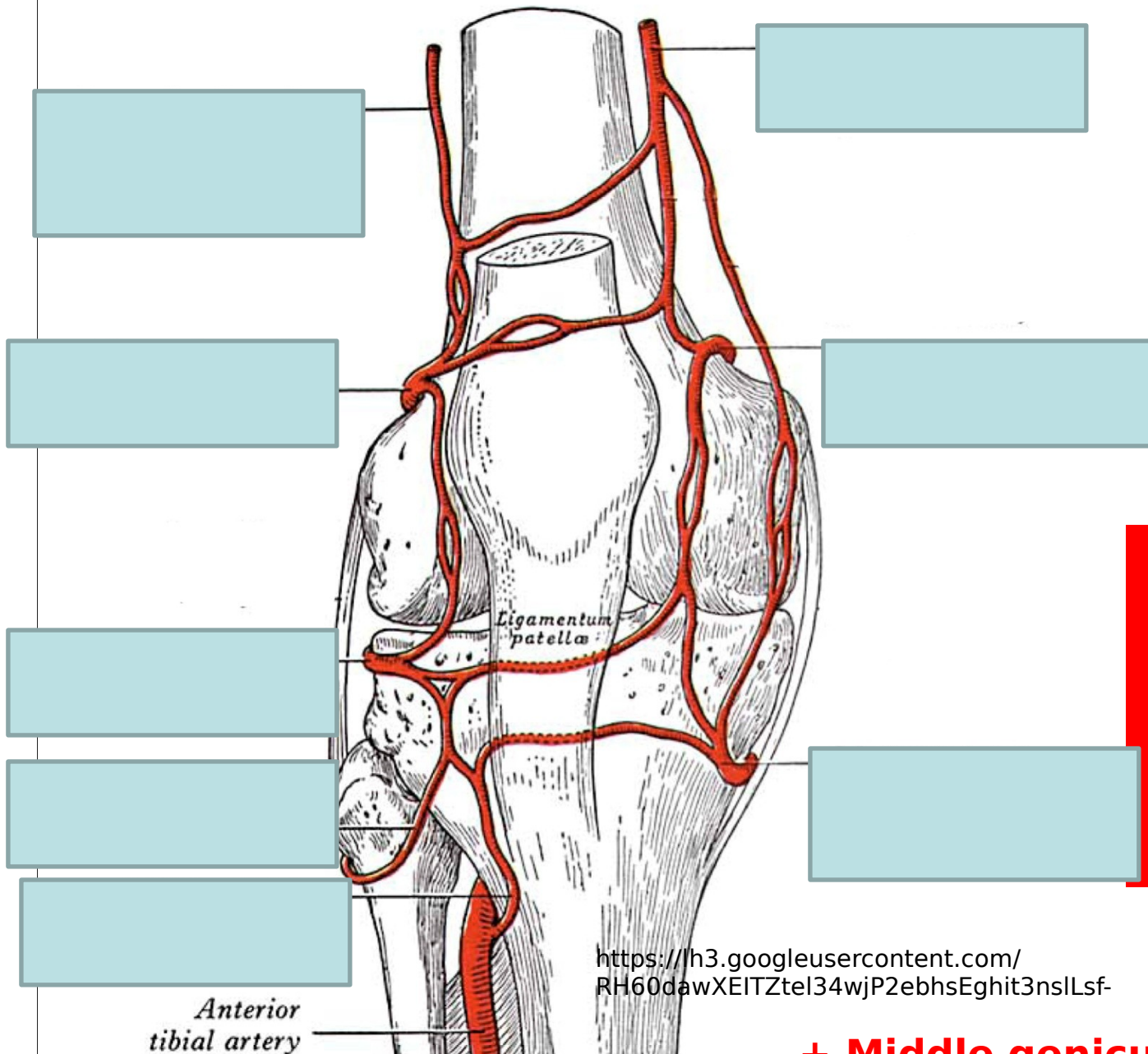
# Arterial supply of knee joint

- **10 arteries supply knee joint**

:

1. Descending genicular artery (**of femoral**)
2. Descending br. of **lat. circumflex femoral**
3. Superior medial genicular (**of popliteal**)
4. Inferior medial genicular (**of popliteal**)
5. Superior lateral genicular (**of popliteal**)
6. Inferior lateral genicular (**of popliteal**)
7. Middle genicular (**of popliteal**)
8. Anterior tibial recurrent (**of ant. tibial**)





1  
0

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*Anterior  
tibial artery*

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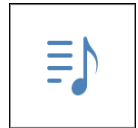
**+ Middle genicular  
+ Posterior tibial  
recurrent**

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# Nerve supply of knee joint

- From all nerves which supply the lower limb:
  1. Femoral nerve
  2. Obturator nerve
  3. Tibial nerve
  4. Common peroneal nerve





# Movements of knee joint

## 1. Flexion

**Muscles on the back of thigh**

**hamstrings (biceps femoris & plantaris)**

## 2. Extension

**Muscles on the front of thigh**

## 3. Medial rotation

**semimembranosus**

**Muscles inserted into upper medial surface of tibia**

**Muscle inserted into head of fibula**

## 4. Lateral rotation

**biceps femoris**



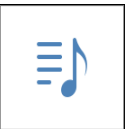
# Locking and unlocking of the knee joint

- **Locking** of the knee is medial rotation of FEMUR on tibia at the end of extension .
- **Unlocking** of the knee is lateral rotation of the femur at the beginning of flexion □ produced by **popliteus**



# Stability of the knee joint

- The knee joint is **not secure** from the skeletal point of view as :
  - 1- The femur and tibia are the longest bones in the body.
  - 2- The articular surfaces are not well adapted to each other.



# Stability of the knee joint



However, the knee joint is still considered one of the stable joints in the body due to:

1- **Strong ligaments** which connect the bones together:

Cruciate □ anteroposterior stability

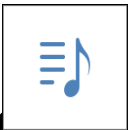
Collateral □ side to side stability

Iliotibial tract □ stability in slightly flexed knee

2- The **powerful muscles which surround** the joint especially **the quadriceps** anteriorly and the hamstrings posteriorly

# **Bursae around the knee joint**

- **Bursae are pillows (pockets) of synovial membrane filled with lubricating synovial fluid. They facilitate movements and reduce friction between tendons of muscles and bones.**
- **Many bursae surround the knee joint.**





**Deep suprapatellar bursa**

**Subcutaneous prepatellar bursa**

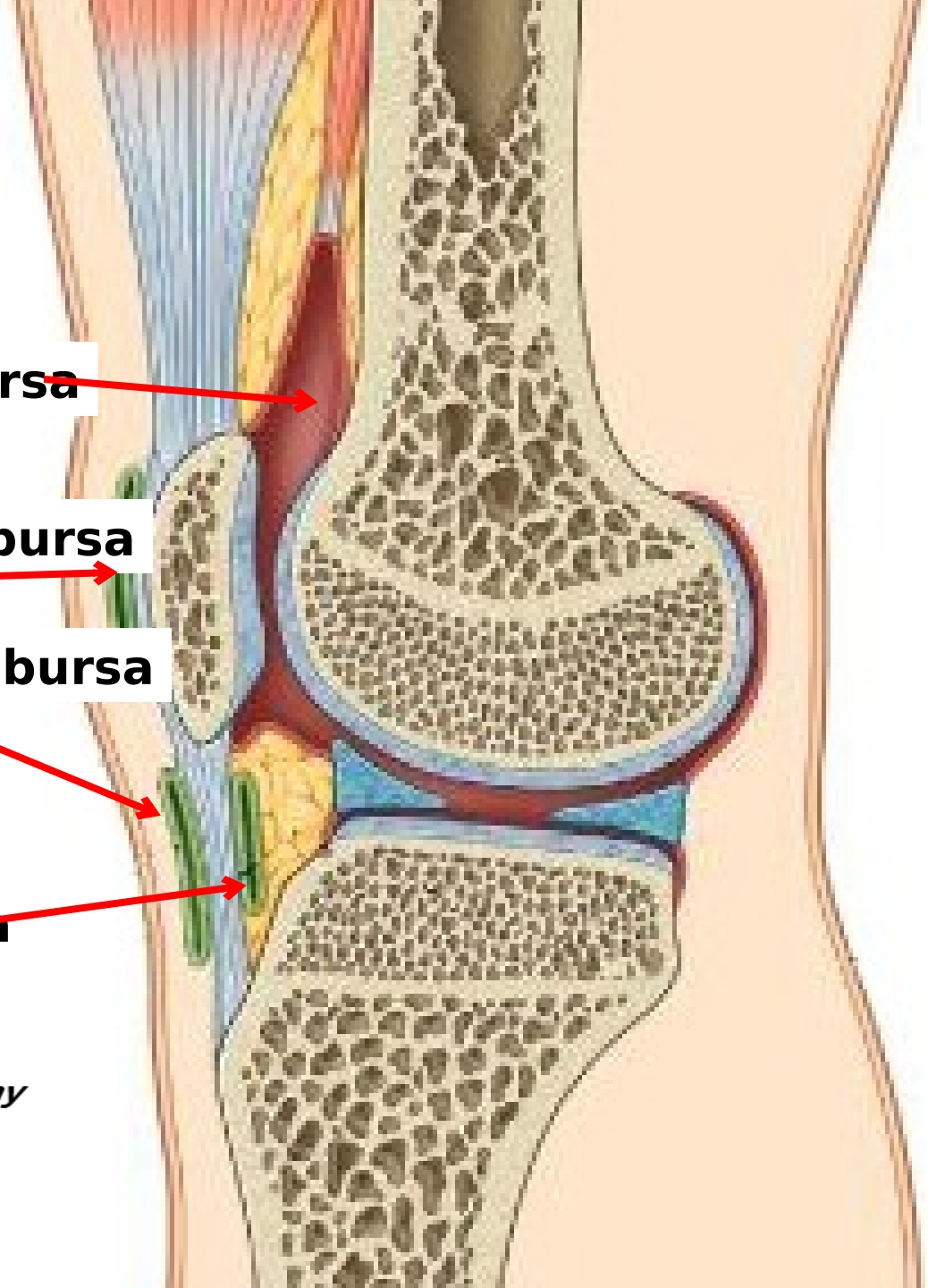
**Subcutaneous infrapatellar bursa**

**Deep infrapatellar bursa**

*Frank H. Netter  
Atlas of Human Anatomy  
6<sup>th</sup> edition*

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Pro  
N  
Inte



**The following is most liable to injury due to a tough kick to the knee in a football match :**

- A. Capsule of knee joint
- B. Medial meniscus
- C. Lateral meniscus
- D. Ligamentum patellae
- E. Iliotibial tract



Thank  
You



***Suggested Textbook***  
*Clinical Anatomy by Sysyems*  
*Richard S.Snell*  
*Pages : 406-414*